INTERNATIONAL SPACE STATION

NAC Space Operations Committee

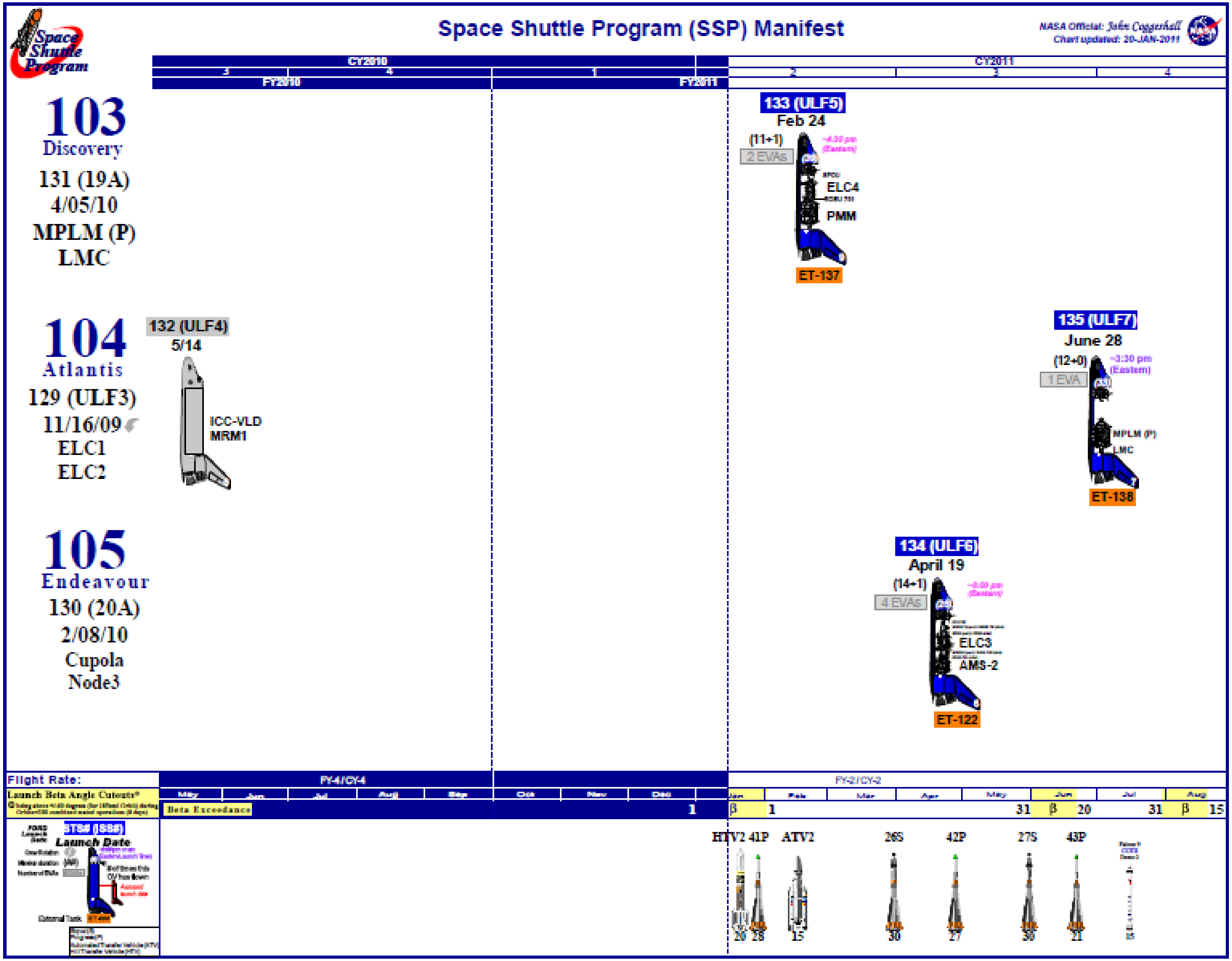
Mark L. Uhran
Assistant Associate Administrator, International Space Station
Space Operations Mission Directorate

Recent Highlights

Late December 2010 / January 2011

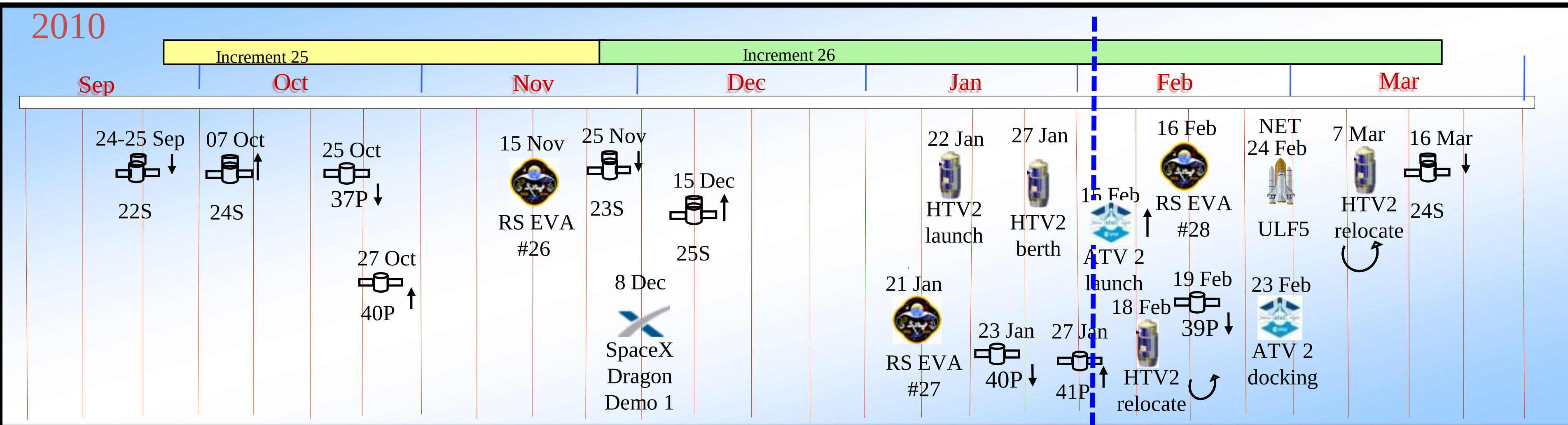
- On December 22, 2010, ground controllers successfully used the Special Purpose Dexterous Manipulator (SPDM) to relocate a cargo transport container on ExPRESS Logistics Carrier 2. The operation demonstrated SPDM capabilities that will be used to transfer two external spares from the HTV2 Exposed Pallet to the ISS. These spares transfers are scheduled to occur the first week in February.
- Dmitri Kondratyev and Oleg Skripochka completed all planned objectives of Russian EVA #27 on January 21.
- The second flight of the Japanese HII Transfer Vehicle (HTV2) began with its launch from Tanegashima Space Center, Japan, on January 22. The vehicle was captured with the station robotic arm on January 27, and berthed to the nadir port of Node 2. HTV2 will remain on the nadir port until February 18, when it will be relocated to the zenith port, in preparation for STS-133/ULF5 docking the next week.
- Progress 40P undocked from the ISS DC-1 nadir port on January 23. Progress 41P launched on January 27 and docked to the DC-1 nadir port on January 29.
- STS-133 astronaut Tim Kopra was injured in a bicycle accident, and replaced by Steve Bowen.

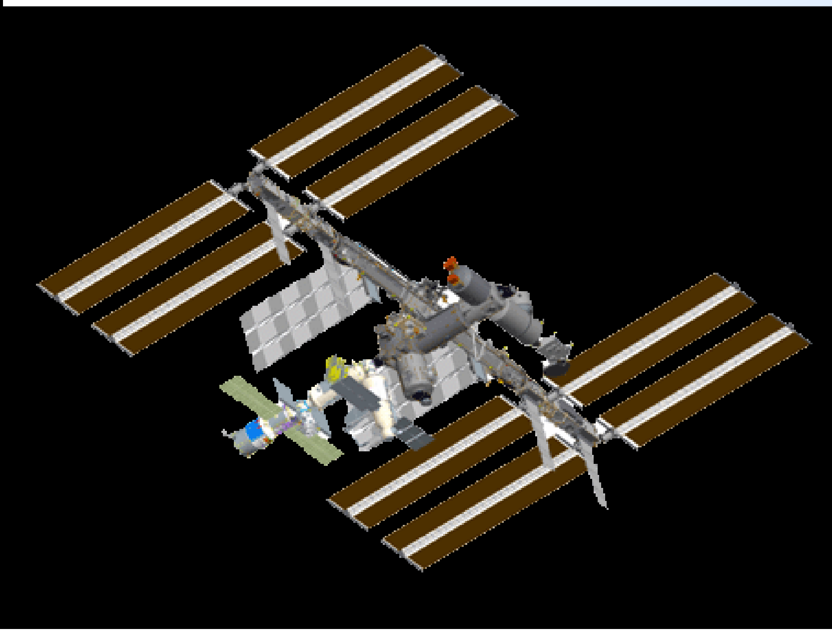
Shuttle Launch Schedule



Planning Manifest
as of 1-20-11

Increment 25-26 Summary





23 Soyuz Crew

Doug Wheelock
Exp 25 CDR

Fyodor Yurchikhin
Exp 25 FE5

Shannon Walker
Exp 25 FE6

24 Soyuz Crew

Alexander Kaleri
Exp 25 / 26 FE1

Oleg Skripochka
Exp 25 / 26 FE2

Scott Kelly
Exp 25 FE3 /
Exp 26 CDR

25 Soyuz Crew

Dmitri Kondratyev
Exp 26 FE4

Paolo Nespoli
Exp 26 FE5

Catherine Coleman
Exp 26 FE6

All dates are Eastern

INCREMENTS 25 & 26

Updated 11 January 2010

Baselined FPWG IDRD SSCN12584,
Working to CR SSCN 12622, IDRD Rev A CR 12502

Inc 24 | Increment 25 | Increment 26 | Inc 27

Sept 10 | Oct 10 | Nov 10 | Dec 10 | Jan 11 | Feb 11 | Mar 11

MRM2: 22S 24-Sept; 10-Oct 24S 16-Mar

MRM1: 23S 26-Nov; 17-Dec 25S

DC-1: 37P 25-Oct; 30-Oct 40P 24-Jan; 30-Jan 41P

SM Aft: 39P 19-Feb; 23-Feb ATV2

N2 Nadir/Zenith: HTV2 27-Jan; HTV2 28-Mar (U/R)

Stage ULF4-24 | Stage 23S-25 (~62 days) | Stage 24S-26 (~90 days) | Stage ULF-5 (~12 days)

9/24 22S Undock; 10/10 24S Dock; RS EVA #26 11/15; 11/26 23S Undock; 12/17 25S Dock; RS EVA #27 Jan 21; RS EVA #28 Feb 21; 2/26 ULF5 Dock; 3/5 ULF5 Undk; 3/16 24S Undock

Skvortsov
Caldwell
Kornienko

E25/E26 FE-1 – A. Kaleri (46/159)(111/157)
E25/E26 FE-2 – O. Skripochka (46/159)(111/157)
E25 FE-3/E26 CDR – S. Kelly (46/159)(111/157)

E25 CDR – D. Wheelock (62/161)
E25 FE-5 – F. Yurchikhin (62/161)
E25 FE-6 – S. Walker (62/161)

E26 FE-4 – D. Kondratyev(91/TBD)
E26 FE-5 – P. Nespoli (91/TBD)
E26 FE-6 – C. Coleman (91/TBD)

	Stage 23S-25	Stage 24S-26	Stage ULF5
Vehicle Traffic	✓Inc start (9/25) ✓24S Dock (10/10) ✓37P Undock (10/25) ✓40P Dock (10/29) ✓23S Undock – End of Inc 25 (11/26)	✓25S Dock (12/17) • 40P Undock (1/24) • 41P Dock (1/30) • HTV2 Berth (1/27) • HTV2 relo to Nod2 Zenith (2/18 – U/R) • 39P Undock (2/19) • ATV2 Dock (2/23) • ULF5 Docked Ops NET (2/26-3/5)	• HTV2 relo to Nod2 Nadir (3/7 – U/R) • 24S Undock - End of Inc 26 (3/16)

Assembly & Maintenance	✓T2 PAU R&R
	✓WPA T-Hose Install
	✓ATV PCE Tests
	✓Sabatier Install
	✓ULF5 Mission Prep
	✓CHeCS RSR relo for ER8 install
	✓MELFI and MSG rack relocation (10/18 & 10/21)
	✓RS EVA #26 (11/15)
	✓Prep for 23S undock
		• RS EVA #27 (Jan 21)
		• OGA Remediation and Sampling
		• HTV2 Prep
		• ISS Stowage Reconfiguration
		• RS EVA #28 (Feb 21) (U/R)
		• Install JAXA Payload Racks MSPR & KOBAIRO
		• FHRC & CTC from EP to SPDM
		• ULF5 Mission Prep
			• PMM Reconfiguration
			  • NASA cargo relo from JPM/JLP
			  • ER8 from PMM to LAB
			  • Robonaut Relo PMM to LAB
			• Prep for 24S return

Software Transitions		✓S0 R2 to R3 ✓Node 3 SYS1 R2 to R3 ✓Node 3 SYS2 R3 to R4	

23 Soyuz Crew

24 Soyuz Crew

25 Soyuz Crew

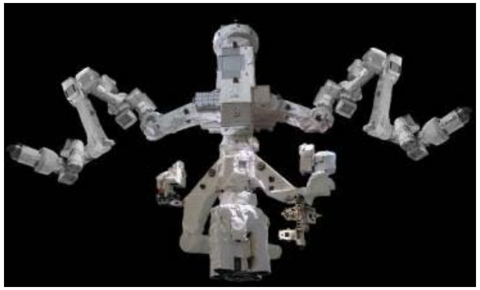
SPDM (Dextre) FRAM Demo

Complete

- Back in the summer, the Special Purpose Dexterous Manipulator (SPDM) swap of two Remote Power Controller Modules (RPCMs) was deferred when it was discovered that the force required to remove the RPCM was greater than had been anticipated and analyzed
- Rather than replan the RPCM swap, it was decided to focus on the SPDM operational checkout needed to support SPDM HTV2 operations in early 2011
- A SPDM checkout / Flight Releasable Attachment Mechanism (FRAM) demo occurred on December 22
  - ✓ Will relocate Cargo Transport Container (CTC) 3 from ELC-2 Site 1 to ELC-2 Site 2 using ground controlled SSRMS/Dextre
  - ✓ Demo will provide operational experience with use of SPDM on FRAM based ORUs in preparation for SPDM ORU transfers during HTV2

CTC Release from ELC 2 Site 1

CTC Return to ELC 2 Site 2

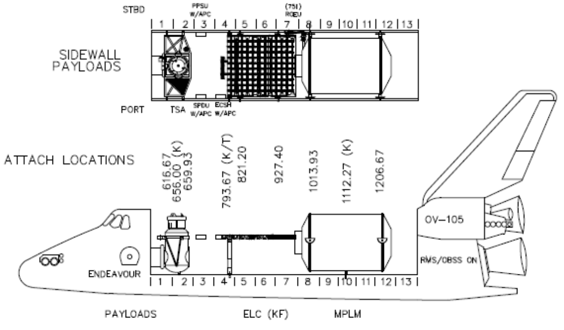


STS-133 / ISS-ULF5 Crew and Mission Summary

STS-133 Crew, from left to right:

Alvin Drew	Mission Specialist #1
Nicole Stott	Mission Specialist #4
Eric Boe	Pilot
Steve Lindsey	Commander
Mike Barratt	Mission Specialist #3
Tim Kopra *	Mission Specialist #2

* Tim Kopra was injured and replaced by Steve Bowen



Orbiter: OV-103 (*Discovery)*

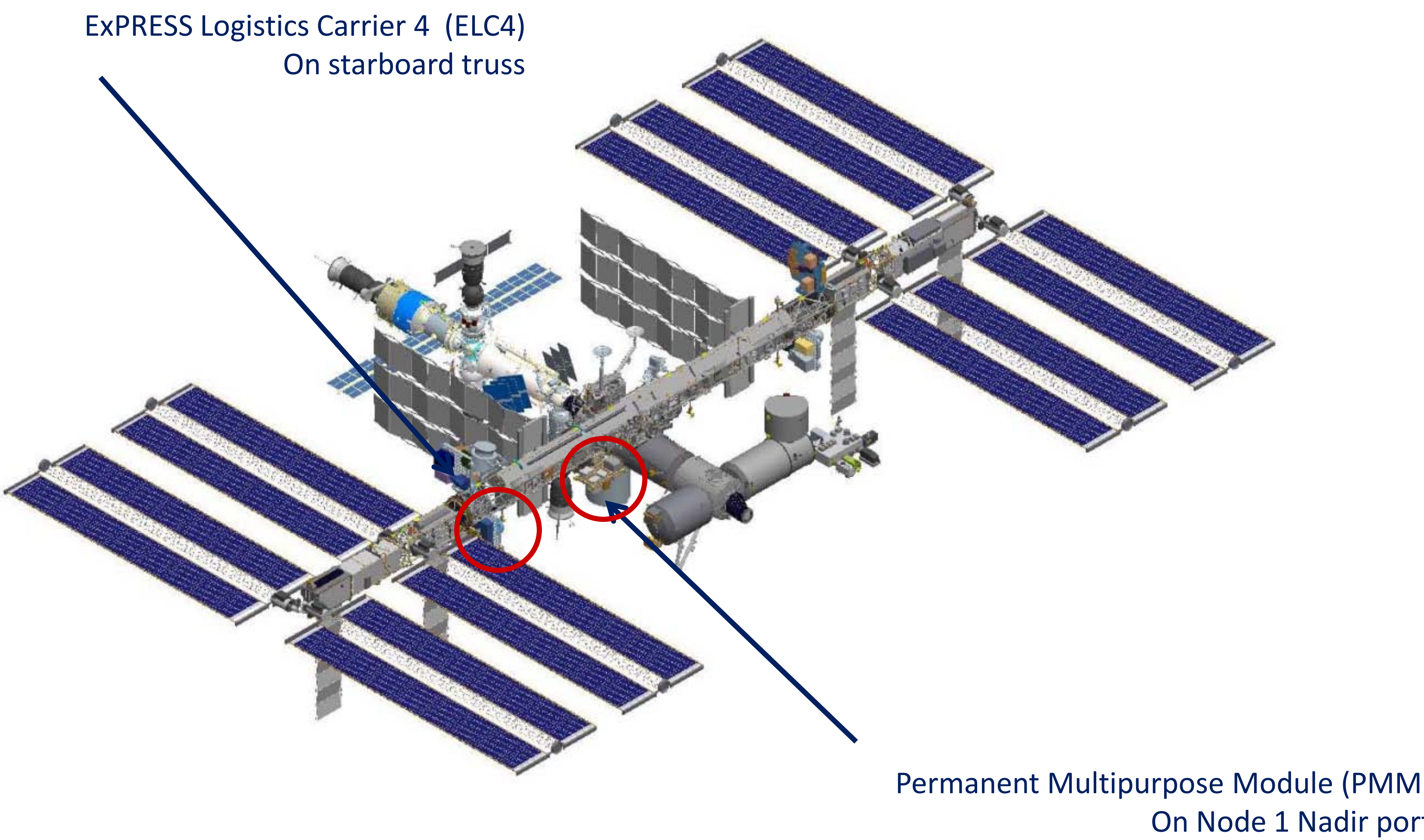
Launch Window Opens:
February 24, 2011

Mission Duration:
11 days nominal + 1 extension + 2 contingency

Mission Highlights:

- Last scheduled flight of the Space Shuttle *Discovery* (its 39th and 12th to the ISS)
- Install the Italian-built Permanent Multipurpose Module (PMM), full of cargo, on the earth-facing port of the Node 1 "Unity" module
  - Derived from the Multipurpose Logistics Module (MPLM) "Leonardo", the PMM provides much needed pressurized stowage and space to perform science and other activities
  - PMM is the last pressurized element to be added to the U.S. operating segment of the ISS
  - Install the ExPRESS Logistics Carrier (ELC) 4 at the lower inboard attachment site on the starboard truss (ExPRESS = Expedite the Processing of Experiments to the ISS)
  - This is the third of four ELCs to be delivered to the ISS (the last will be on STS-134)
  - ELC4 carries a spare Heat Rejection System Radiator and provides five additional attachment sites for external payloads and spares
- Conduct two EVAs (Extravehicular Activity)
  - Relocate the failed ammonia Pump Module to an external stowage platform and vent
  - Retrieve the Lightweight Adapter Plate Assembly (LWAPA) from the Columbus external payload facility for return in the shuttle payload bay
  - Install camera equipment on the Special Purpose Dexterous Manipulator (SPDM), also known as "Dextre"
  - Install / reconfigure a variety of external equipment
  - Transfer critical hardware, payloads and logistics resupply
  - Perform science payload activities
  - Launch Robonaut 2, a highly dexterous, humanlike robot, inside the PMM

STS-133 / ISS-ULF5 ISS Configuration Change



STS-134 / ISS-ULF6 Mission Overview

Duration: 14+1+2

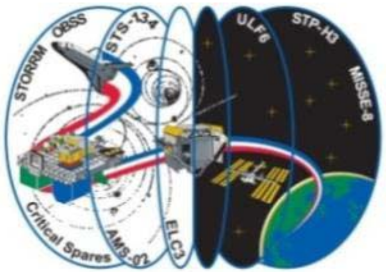
Crew: 6

Launch: NET April 19, 2011

Orbiter: Endeavour (OV-105)

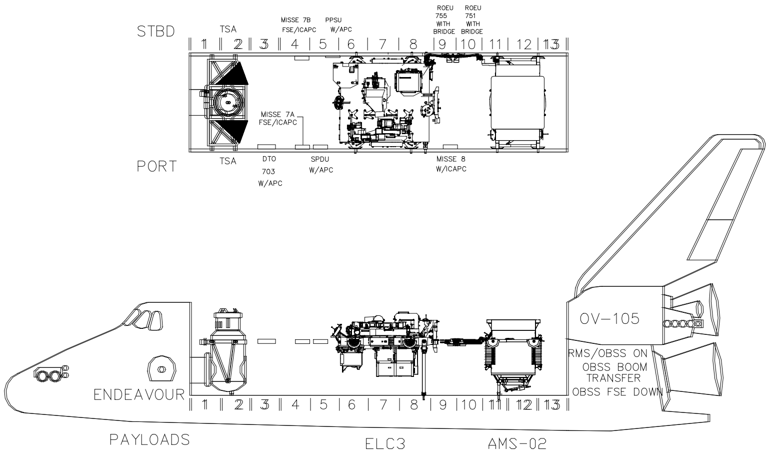
Payload Bay:

- Alpha Magnetic Spectrometer 2 (AMS-2)
- ExPRESS Logistics Carrier 3 (ELC3), with spare Ammonia Tank Assembly, S-band Antenna Subassembly #2 & 3, High Pressure Gas Tank, Space Test Program Houston 3 DOD payload, Cargo Transport Container-6, Special Purpose Dexterous Manipulator arm, and a spare ELC pallet controller avionics box
- Materials ISS Experiment (MISSE)-8 (in shuttle sidewall carrier)
- Internal ORUs: Urine Processing Assembly Recycle Filter Tank Assembly, Carbon Dioxide Removal Assembly dessicant bed



Major Tasks:

- Install the AMS-2 at S3 upper inboard attachment site
- Install the ELC3 on P3 upper attachment site
- Retrieve MISSE 7 payload from ELC2 for return
- Install MISSE 8 on ELC2
- Perform four EVAs
- Transfer middeck cargo and consumables



STS-135 / ULF7 Mission Overview

Duration: 12+0+2

Crew: 4 up/4 down; 4 up/10down for rescue

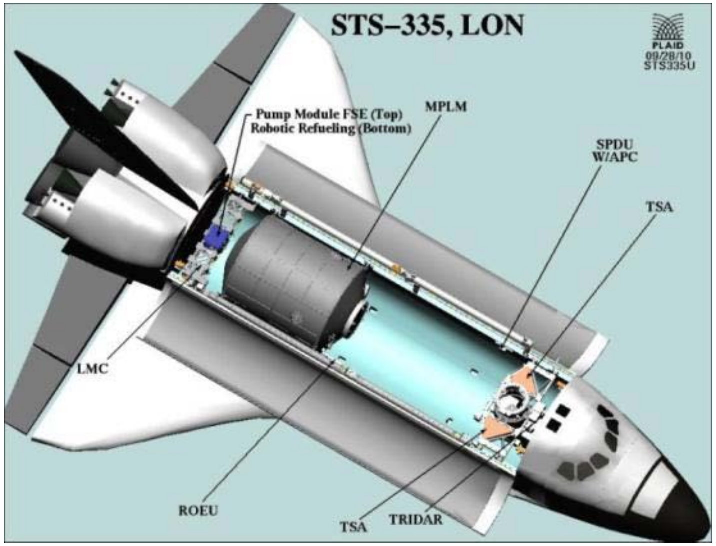
Launch: June 28, 2011

Orbiter: Atlantis (OV-104)

Payload Bay:

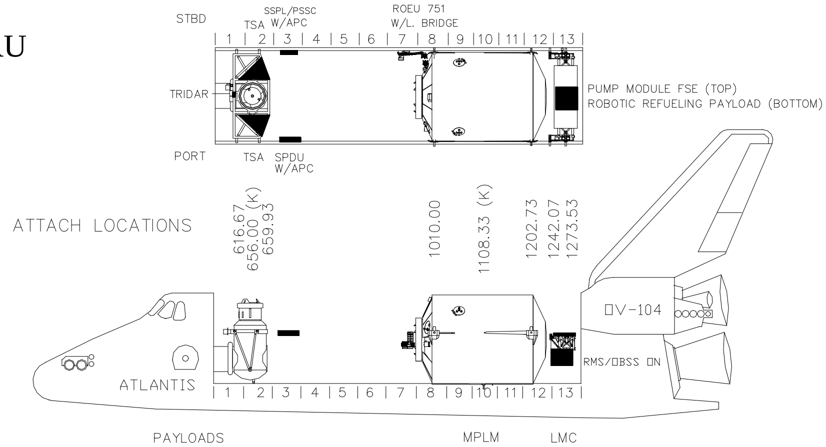
- Multipurpose Logistics Module (MPLM), with crew supplies, utilization, and spares
- Lightweight Multi-Purpose Experiment Support Structure Carrier (LMC), with Robotics Refueling Payload (RRP) (up), and failed Pump Module Assembly (PMA) (down)

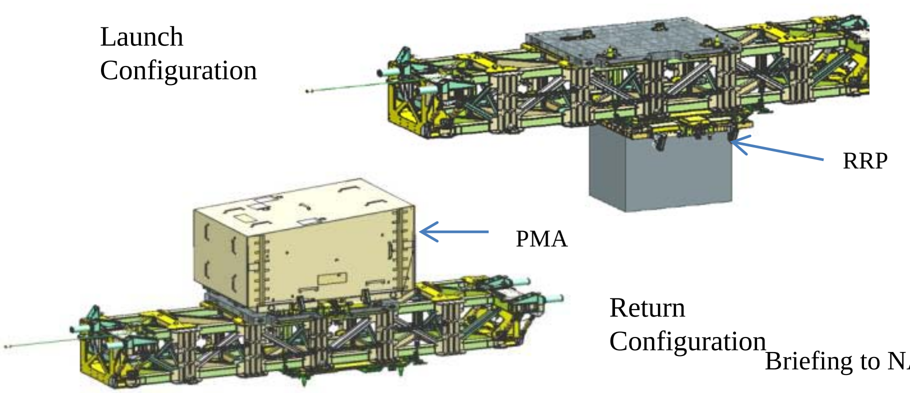
Potential return of BMRRM (Bearing Motor Roll Ring Module) not yet resolved



Major Tasks:

- Transfer MPLM and middeck cargo and consumables
- Perform one EVA
  - Remove failed Pump Module from External Stowage Platform 2 (ESP2) and install on the LMC
  - Remove RRP from the LMC and install on the SPDM Enhanced ORU Temporary Platform (EOTP)
- Deploy Picosat (post undocking)

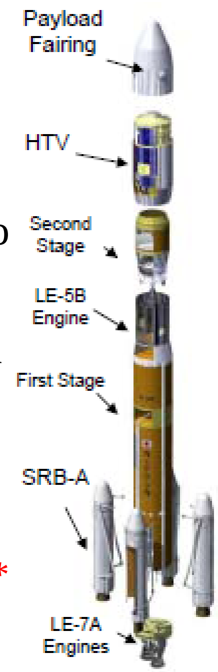


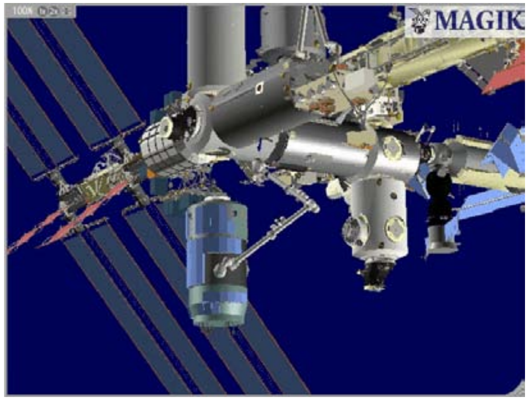


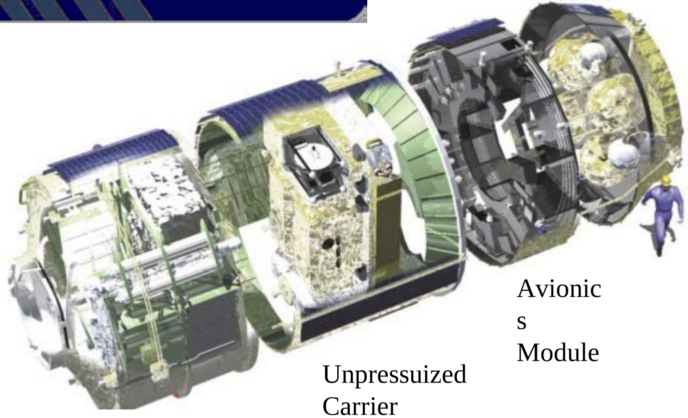
H-II Transfer Vehicle (HTV) Second Flight

In Progress

- HTV launches atop an H-II B rocket, from Tanegashima Space Center (TNSC), Japan
- After rendezvous with ISS, HTV is captured with the SSRMS and berthed to the Node 2 Nadir (N2N) port
- To enable STS-133 to dock to the ISS in February, the HTV will be temporarily relocated to Node 2 Zenith (N2Z) port
- Second flight (HTV-2) milestones
  - ✓ Launch: January 22, 2011*
  - ✓ Capture/Berth: January 27, 2011
  - – Relocate to N2Z: February 18, 2011
  - – Move back to N2N: NET March 7, 2011
  - – Unberth: March 28, 2011
  - – Re-entry: March 29, 2011
- Second flight mission objectives
  - – Deliver both pressurized and unpressurized cargo
  - – Dispose of ISS waste on reentry (HTV has no return capability)

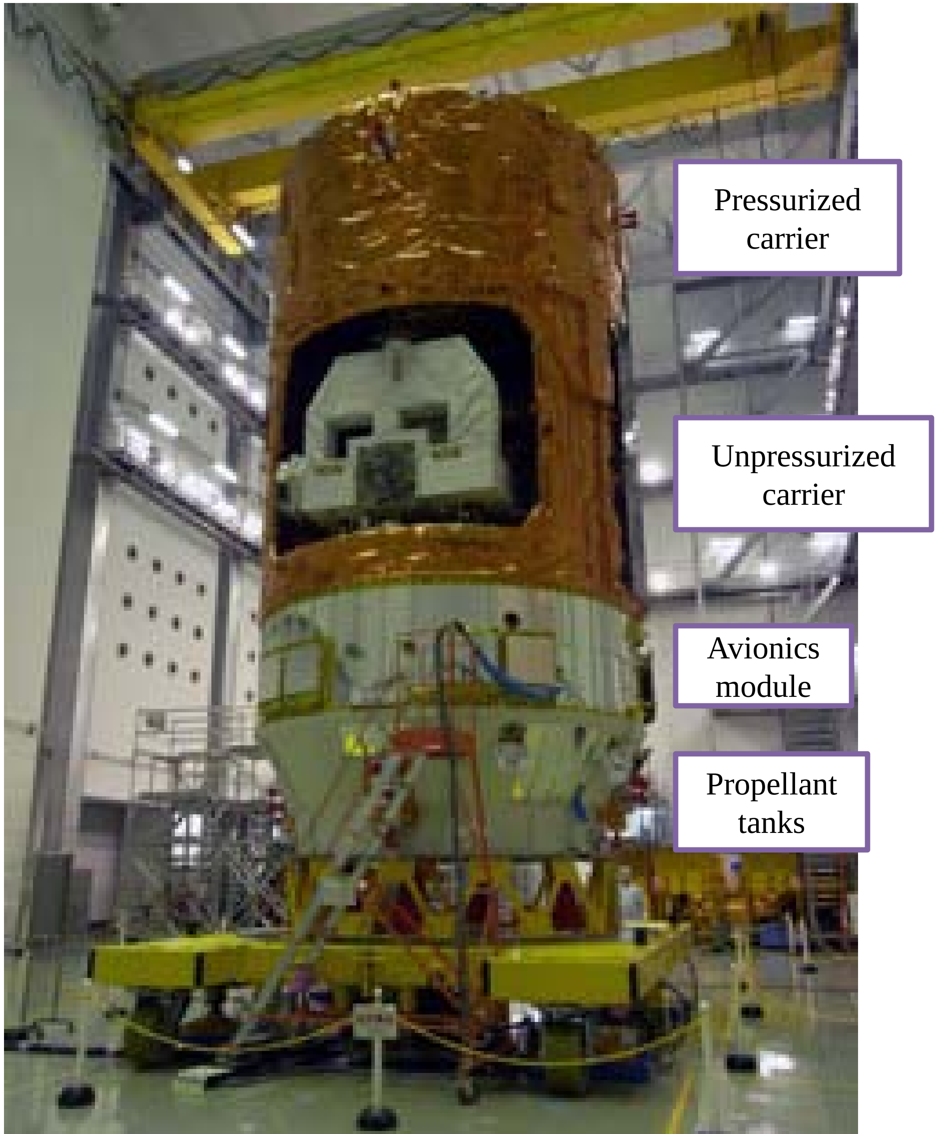


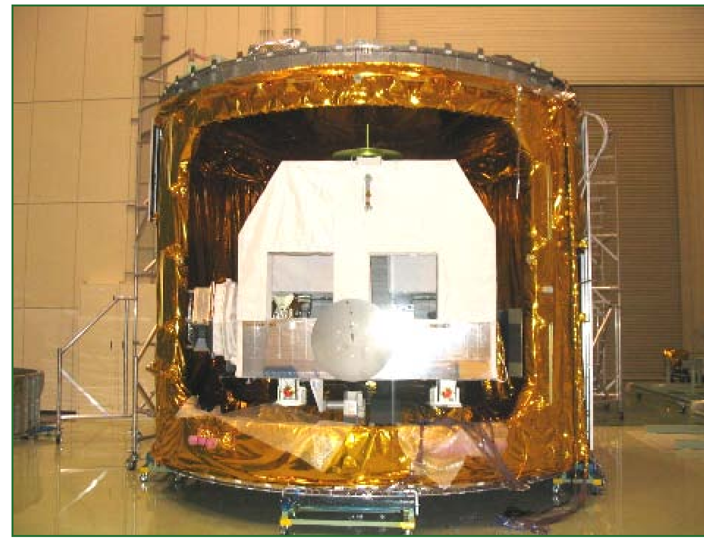




* Launch was delayed from 1/20 to 1/22 due to bad weather at launch site. Did not affect berthing date.

HTV2 Payload Overview

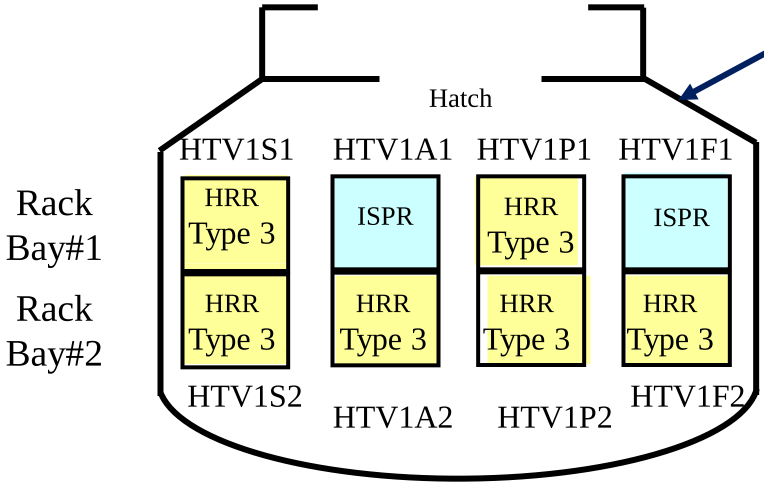




Exposed Pallet (EP)
In Unpressurized
Carrier

HTV Cargo Overview (Pressurized)

6 HRR type 3 & 2 ISPR



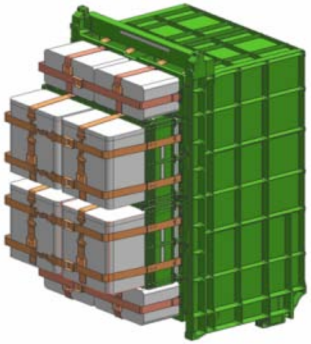
Pressurized Carrier

Kobairo
(aka GHF)

+

MSPR

+



HRR Type 3

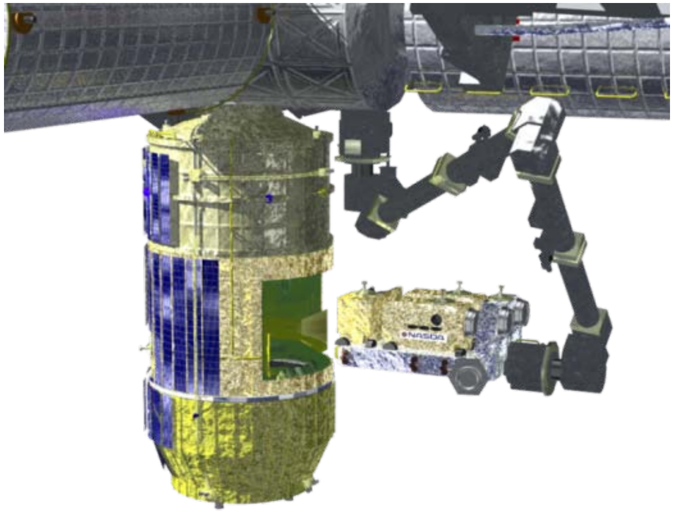
+

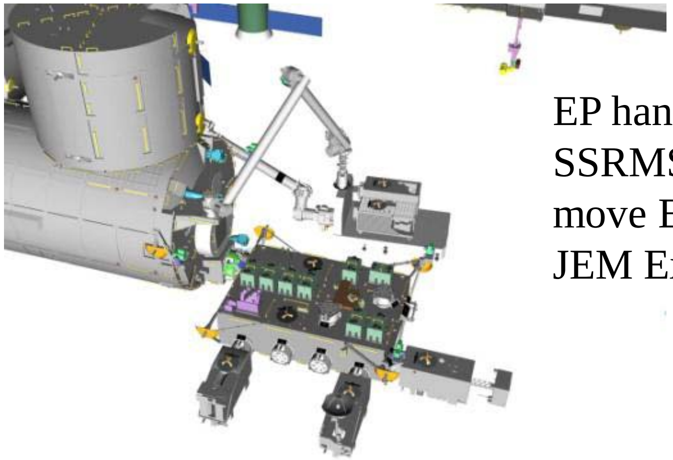
CWC-I (4)

GHF = Gradient Heating Furnace
MSPR = Multi-purpose Small Payload Rack
HRR = HTV Resupply Rack
ISPR = International Standard Payload Rack
CWC-I = Collapsible Water Container- Iodine

Robotics for Exposed Pallet Operations

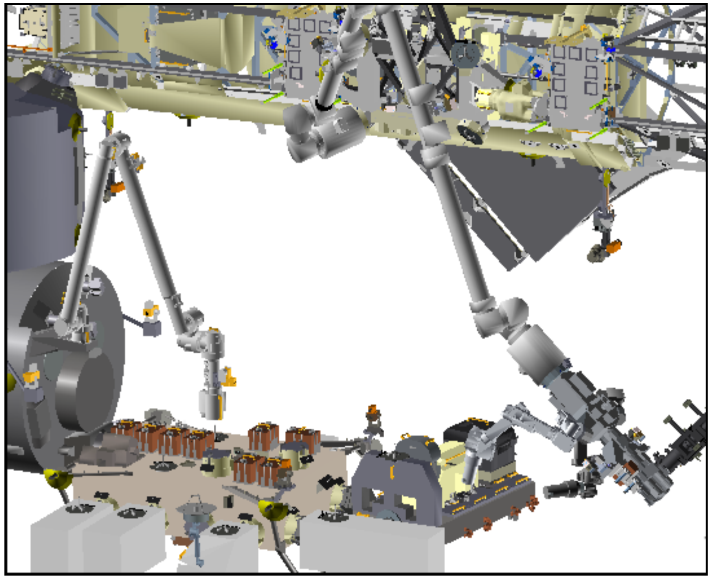
SSRMS moves EP in/out of HTV2





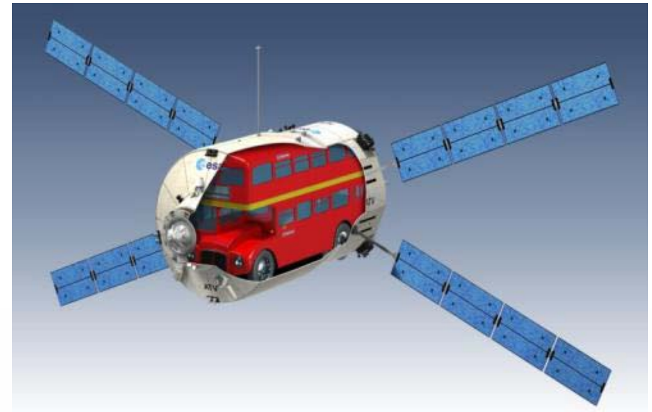
EP handoff by SSRMS/JEMRMS to move EP to/from the JEM Exposed Facility

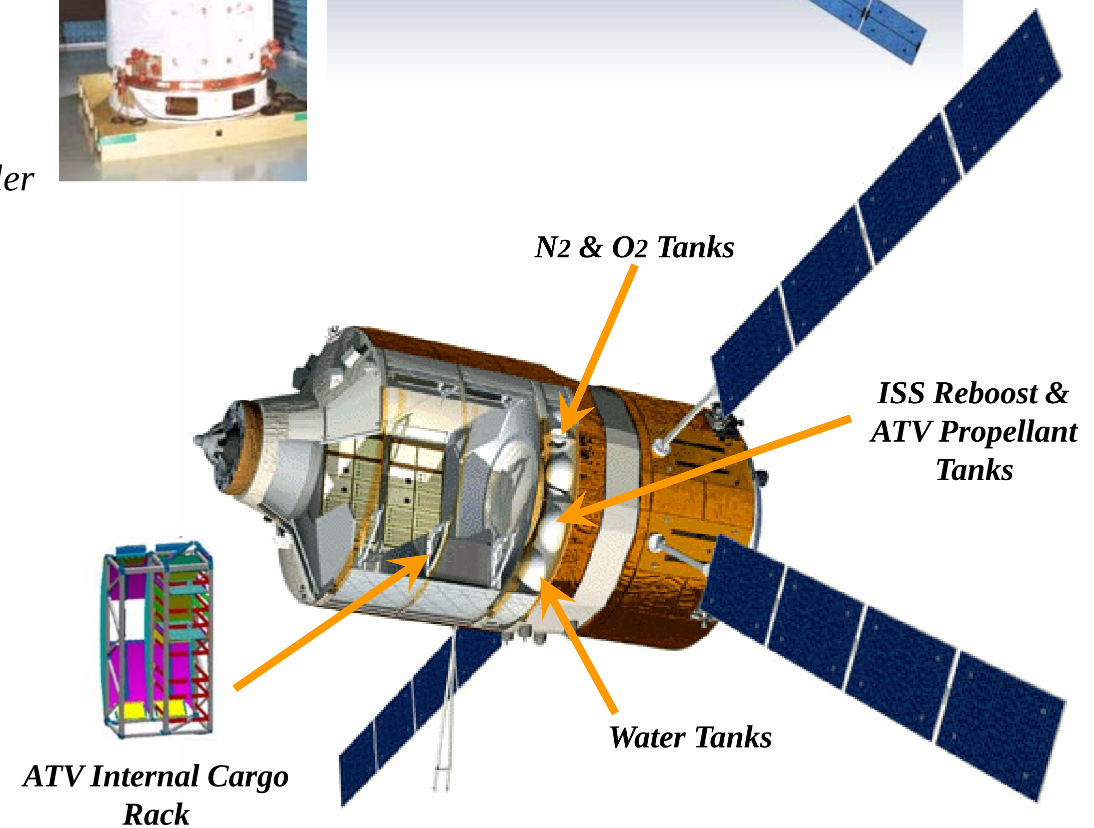
SPDM used to transfer the Flex Hose Rotary Coupler and Cargo Transport Container from the EP to ELC4



Automated Transfer Vehicle (ATV) Second Flight

- Launched by Ariane 5 from Kourou, French Guiana
- Docks to Russian Segment ports
- Can re-supply ISS with atmospheric gas, water, propellant, and dry goods
- Capable of performing many ISS re-boost and attitude burns
- Provides ISS waste disposal upon re-entry (no recoverable return capability)
- ATV2 vehicle designation: *Johannes Kepler*
- ATV2 flight milestones (all dates Eastern and subject to change)
  - Launch February 15, 2011
  - Dock February 23, 2011
  - Undock June 4, 2011

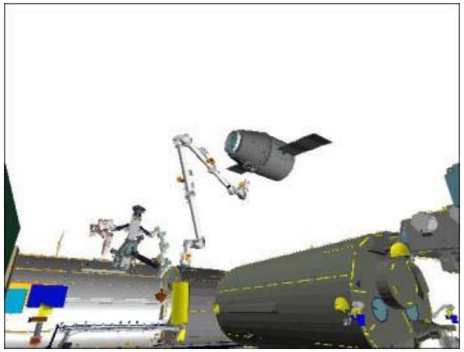


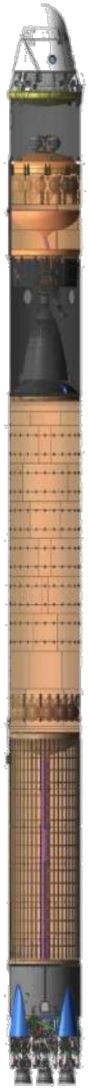


SpaceX Falcon/Dragon Demo Flights

- The Dragon capsule is launched on a Falcon 9 rocket from Space Launch Complex 40 (SLC-40), Cape Canaveral Air Force Station, Florida
- SpaceX will be the first commercial free-flyer capture and uninstall/release
- Docked mission is 14 days with capability up to 30 days
- Dragon return is via water landing and recovery off Pacific coast
- Demo flight launch schedule (subject to change):

✓	SpaceX-Demo 1	Dec 8, 2010	Launch / separate, orbit, receive & transmit telemetry, system checkout, re-entry & recovery
–	SpaceX-Demo 2	Jul 2011	Approach within 10 km of ISS, transmit telemetry to ISS, ISS commanding of Dragon, on-orbit checkout
–	SpaceX-Demo 3	Oct 2011	Full mission profile, capture and berth to ISS, up to 800 kg cargo transfer, return & recovery





NPO Key Challenges

- Since Phase A (1984-88), ISS mission requirements have spanned three domains:
  - Scientific objectives – predominantly government funded, and selected through merit-based independent peer review processes.
  - Technological objectives – government/industry cost-shared to the extent possible, and selected through technical concurrence processes.
  - Economic objectives – predominantly industry funded, and selected by capital markets.
- The scope of mission requirements drove a spacecraft design that has an extraordinary full-service capability at high capacity throughput:
  - 33 static internal, pressurized payload rack sites (23 U.S.)
  - 30 static external, attached payload pallet sites (23 U.S.)
  - dynamic distributed utilities: power, thermal, vacuum, waste venting, data processing, telecommunications (76.6% U.S.)

Managing a diversified, high-yield R&D portfolio for ISS requires an "honest broker" function that operates with objectivity.
Value-based investment decision making represents "best practices".

Key Concept of Operations

Scope of ISS Utilization: ISS is capable of hosting multiple research and development (R&D) communities.

(1) NASA Utilization

NASA exploration-driven research is the primary mission objective, and includes two main components:

(1) human biomedical research necessary to extend crews further into space; and,

(2) engineering research necessary to develop and demonstrate next generation spacecraft technologies.

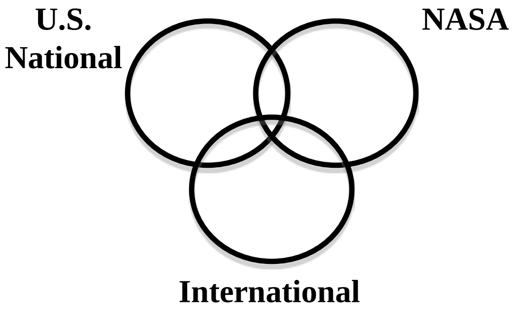
Requirements are generated, managed and funded by the responsible mission directorates/offices at NASA Headquarters (SMD, ESMD, SOMD, OCT).

(2) U.S. National Utilization

The remaining U.S. capacity is available to support U.S. national needs for basic and applied research in fields such as human health, energy and the environment. Requirements are generated, managed and funded by external organizations that hold agreements with NASA **(Scope of NPO)**.

(3) International Utilization

Canadian, European, Japanese and Russian partners each manage respective utilization programs consistent with their governing policies. Requirements are generated, managed and funded by the respective International Partner.



Governing Policies

- NASA Authorization Act of 2005, Section 507, National Laboratory Designation, Public Law 109-155, enacted Dec 30, 2005.

- NASA Authorization Act of 2010, Section 504, Management of the ISS National Laboratory, Public Law 111-267, enacted Oct 11, 2010.

- Federal Grant and Cooperative Agreement Act of 1977 (aka "Chiles Act"), Public Law 95-224, enacted Feb 3, 1978.
  - Section 6: Use of Cooperative Agreements

    "(1) …the principal purpose of the relationship is the transfer of anything of value to the recipient to accomplish a public purpose of support or stimulation authorized by Federal statute…"

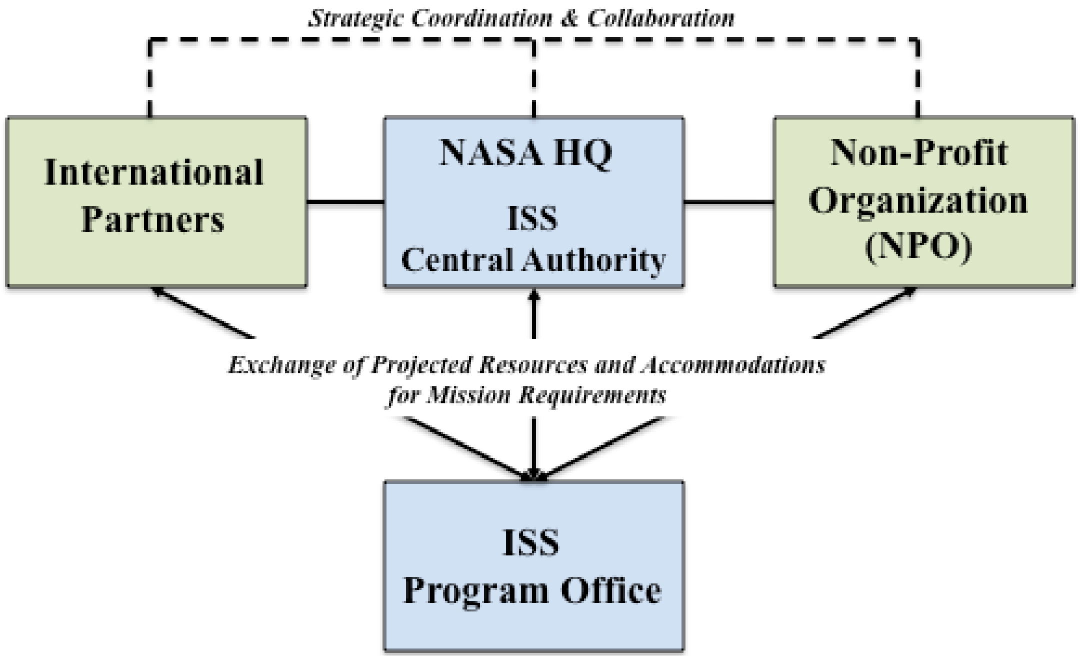
    A share of ISS accommodations and resources will be transferred to accomplish the public purpose of stimulation directed in PL 109-155.

    "(2) …substantial involvement is anticipated between the executive agency and recipient when carrying out the activity contemplated in the agreement."

    Substantial NASA involvement remains required in order to safely and effectively integrate non-government mission requirements into ISS operations.

- NPR 5800.1 Grant and Cooperative Agreement Handbook

Leadership Team



Level-I
(Policy & Technical Officer)

Mark Uhran
Assistant Associate Administrator, ISS
Office of Space Operations
NASA Headquarters

- **26 years experience on space station program working at the interface between developers/operators and R&D users.**

Level-II
(National Laboratory Project Officer)

Marybeth Edeen
Manager, ISS National Laboratory Project
ISS Program Payloads Office
NASA Johnson Space Center

- **23 years experience on human space flight programs working on science & technology payload physical, analytical and operations integration.**

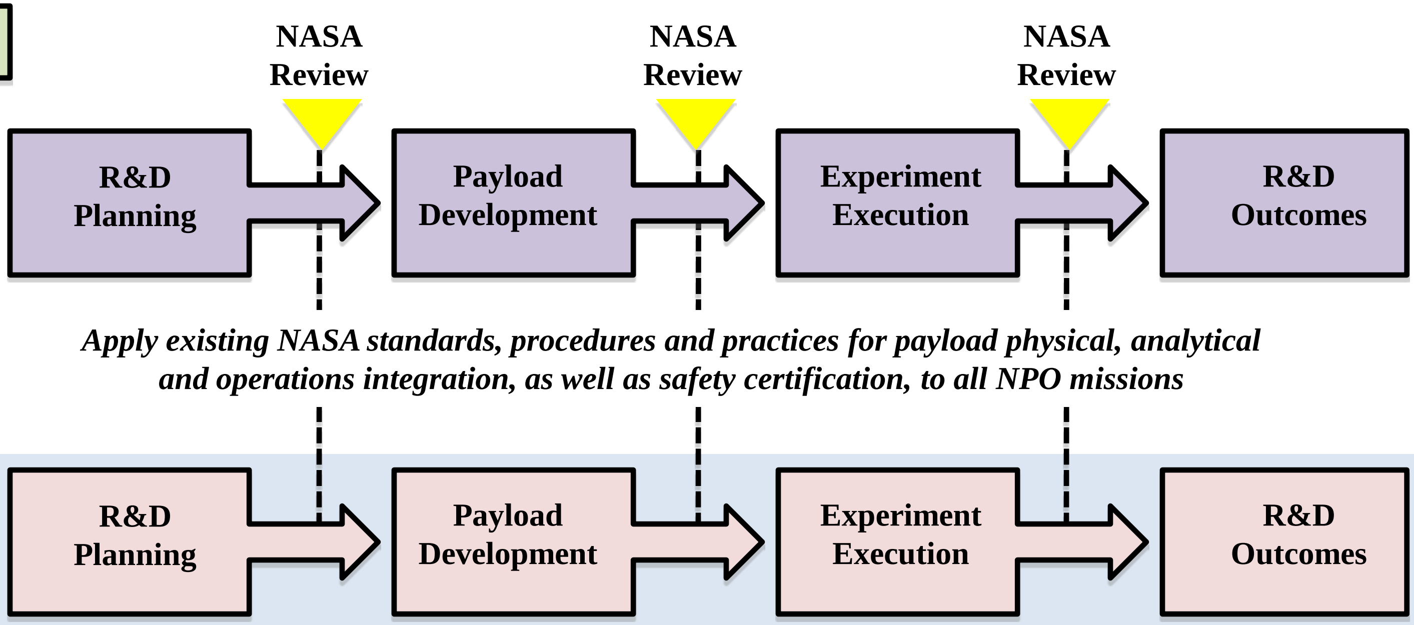
Accountable line managers:

William Gerstenmaier, Associate Administrator, Space Operations
Michael Suffredini, Program Manager, International Space Station
Rod Jones, Manager, ISS Payloads Office

Top-Level NPO Work Flow
(shaded area)

NASA Funding

NASA Missions
• biomedical research
• technology development
• STEM education



Non-USG Missions
• Non-Profit Institutions
• Private Firms
• OGA Missions
• basic S&T precursors
• STEM education

Non-NASA Funding
• *Institutional contributions*
• *Private investments*
• *Other government agencies*

NPO Primary Functions
• Establish Board of Directors for advocacy with resources network (key component)
• Stimulate non-government uses of ISS (non-profit institutions, private firms)
• Structure opportunities and program development initiatives
• Facilitate basic S&T translational research through conventional peer-reviewed process
• Match high-value R&D projects to funding sponsors for applications development
• Manage overall non-NASA S&T portfolio using value-based principles
• Conduct best-in-class communications on benefits and outcomes

Four Risks Identified

1. Organizational conflict of interest
2. NASA-NPO working relationship
3. Requirements integration and prioritization
4. Cargo transportation availability

1. Organizational Conflicts of Interest

- Two functions of the NPO for ISS will involve the selection of users and the prioritization to use ISS.
- Objectivity is critical for the NPO to be successful.
- Risk Mitigation:
  - Limit offerors to nonprofit entities since a for profit entity is more likely to have a financial interest in an end user. Use of nonprofits creates better appearance of objectivity.
  - Prohibit offerors from being users of ISS
    - Decisions about selection process may be questioned if NPO is a user of ISS.
    - Decisions about prioritization may be questioned if NPO is a user of the ISS.
  - Prohibit offerors from holding financial interests in user entities.

2. NASA-NPO Working Relationship

- Cooperative Agreement is applicable when, "*substantial involvement is anticipated between the executive agency and recipient when carrying out the activity*".

- For this agreement, substantial involvement is anticipated in two areas:

  (1) NASA headquarters must implement Federal policy aspects effecting the share of U.S. resources and accommodations to be made available to non-government users via NPO.

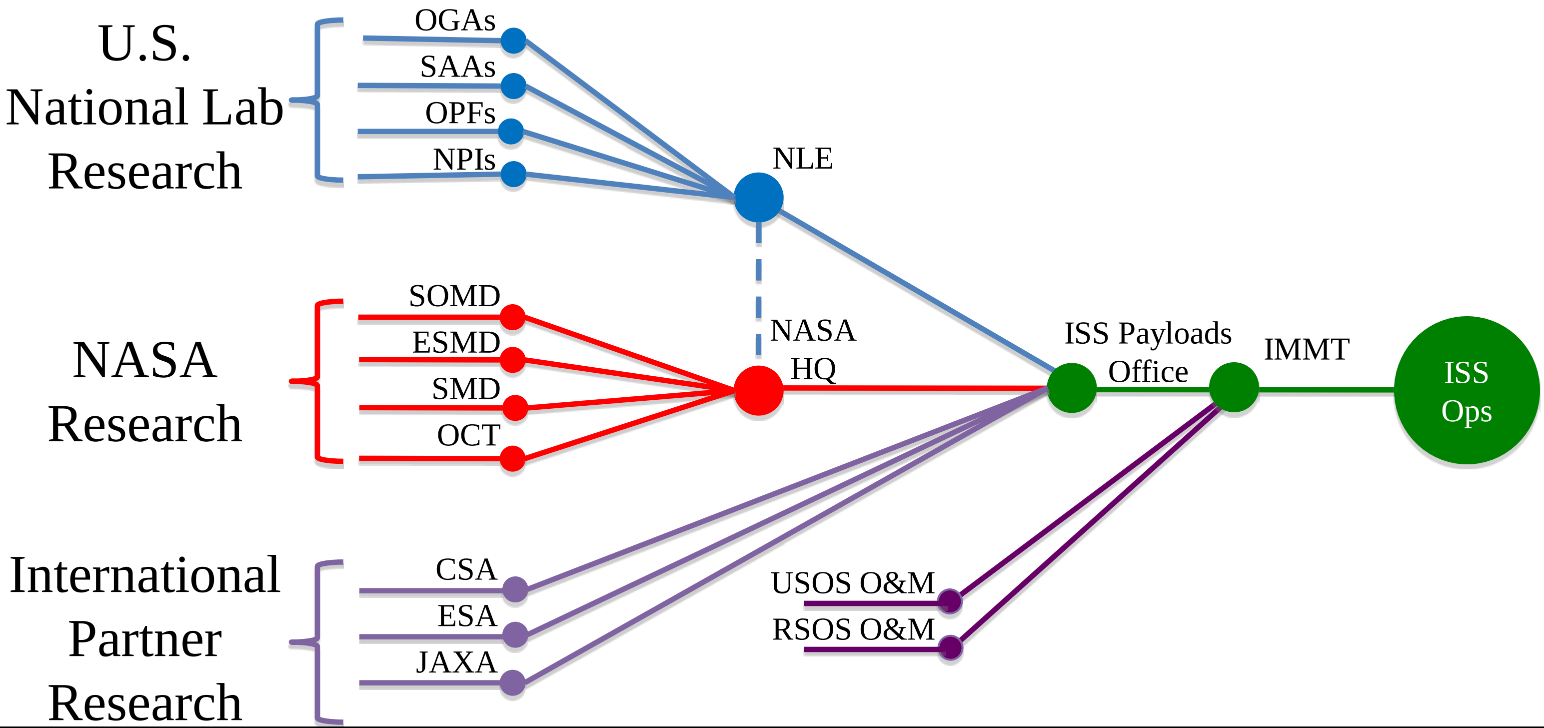
  Risk Mitigation: Within SOMD, an ISS Central Management Authority should be held accountable to Administrator for allocation of ISS resources and accommodations among NASA and non-NASA users.

  (2) JSC ISS Program Office must implement standing procedures for payload physical, analytical and operations integration consistent with past practices to ensure clear assignment of responsibilities and safe operations.

  Risk Mitigation: Within JSC ISSPO a dedicated ISS National Laboratory Project was established in Feb, 2009, and staffed to support this objective.

3. Requirements Integration & Prioritization

- **An orderly process is essential for integrating mission requirements across competing organizations.**
- **Risk Mitigation: queuing models represent “best practice” (illustrated below). Each node in queue responsible for prioritization within its scope.**



CSA – Canadian Space Agency ESA – European Space Agency ESMD – Exploration System Mission Directorate (NASA) IMMT – ISS Mission Management Team JAXA – Japan Aerospace Exploration Agency NLE – National Lab Entity (U.S.) NPI – Non Profit Institutions (U.S.) O&M – Operations and Maintenance	OCT – Office of the Chief Technologist (NASA) OGA – Other Government Agency (U.S.) OPF -- Other Private Firm (U.S.) RSOS – Russian Segment Operating System SAA -- Space Act Agreement (NASA) SMD – Science Mission Directorate (NASA) SOMD – Space Operations Mission Directorate (NASA) USOS – U.S. Segment Operating System

4. Cargo Transportation Availability

- **ATV, HTV and Progress required predominately for O&M of ISS and NASA mission research**
  - U.S. purchase of Progress services only planned through 2011

- **Commercial Resupply Service (CRS) flights required to provide sufficient up/down mass for National Lab users**

COTS

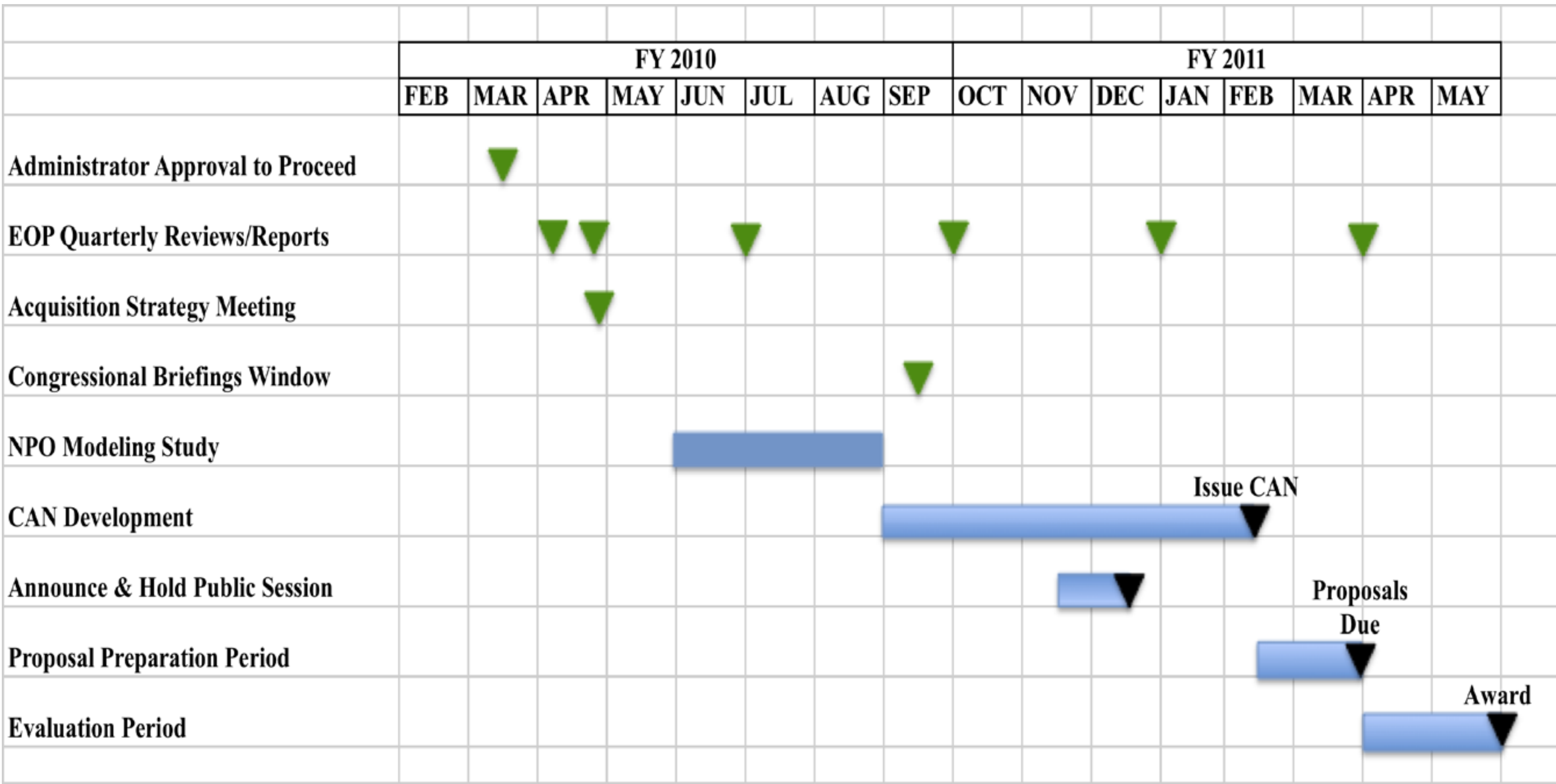
- **SpaceX**
  - Demo 1 Dec 15, 2010
  - Demo 2 Jun 2011
  - Demo 3 Sep 2011
    - Berthing to ISS
- **OSC**
  - Demo Nov 2011
    - Berthing to ISS

CRS

- **SpaceX**
  - CRSX 1 Dec 7, 2011
  - CRSX 2 Apr 2012
  - CRSX 3 May-Jun 2012
- **OSC**
  - CRSO 1 Jun-Mar 2012
  - CRSO 2 Jul-Sep 2012

CRS flights are critical to success of National Lab.

Schedule



FY 2010
FY 2011
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
Administrator Approval to Proceed
EOP Quarterly Reviews/Reports
Acquisition Strategy Meeting
Congressional Briefings Window
NPO Modeling Study
CAN Development
Issue CAN
Announce & Hold Public Session
Proposals Due
Proposal Preparation Period
Award
Evaluation Period

BACKUP

Increment 25/26 Stage EVAs
RS EVA 27

Complete

- Date:
  - January 21, 2011 (Total EVA duration was 5 hrs, 23 min)

- Crew: Dmitri Kondratyev and Oleg Skripochka
- Tasks:
  - ✓ Install the radio data transmission system for the Napor experiment (RSPE/РСПИ) on the Service Module (SM) working compartment
  - ✓ Photograph the SM plasma pulse injector monoblock (ИПИ-СМ), place a protective cover on, deactivate and remove the monoblock from the portable workstation in Plane II of the SM working compartment 2
  - ✓ Place the protective cover on the Expose-R monoblock, deactivating and removing the monoblock from the portable workstation in Plane II of the SM working compartment 2
  - ✓ Install/connect TV camera at MRM1 [АСП] passive docking unit side
- Potential jettison items:
  - ✓ Protective cover of the high speed data transmission system (СВПИ) unit
  - ✓ Cable reel for the radio data transmission system (РСПИ)

Increment 25/26 Stage EVAs
RS EVA 28

- Date:
  - February 16, 2011
- Crew: Dmitri Kondratyev and Oleg Skripochka
- Tasks:
  - Remove two Komplast panels (#2 and #10), from the FGB
  - Install radiometric system [РК-21-8] on the portable multipurpose work station (УРМ-Д) (Plane II) of the SM Working Compartment 2 (SVCh-Radiometriya experiment)
  - Remove the Ferrozond restraint (foot restraint) installed on the SM working compartment 2
  - Assemble and connect the Molniya-gamma unit on the portable multipurpose workstation in Plane IV of the SM Working Compartment 2
- Potential jettison items:
  - Launch the Radioskaf nanosatellite
  - Ferrozond foot restraint (~25 kg/m^2)
  - Protective cover of the Molniya-Gamma unit
  - 2 Molniya-Gamma MLI blankets (~14 kg/m^2)

Only if these two items are bundled

Status of Soyuz Anomalies

- *Soyuz 24S Elevated Partial Pressure of Oxygen (PPO2)*
  - During the Soyuz 24S (TMA-01M) pre-launch suit checks, increased total pressure and partial pressure of O_2 was noted in the Soyuz. While the crew was seated in the Soyuz on the launch pad, approximately 2 hours prior to launch, they were asked to open the O_2 supply valve per standard procedure. They reported a loud sound from the valve and a rapid pressure increase. The descent module compartment pressure rose to 933 mmHg and 335 mmHg ppO2 (35.9% PPO2). MCC-M instructed the crew to open the equalization valve (between the descent module and orbital module), and then to open the orbital module pressure relief valve - this vented both modules overboard since the equalization valve was open. The O_2 supply valve was then cycled multiple times with no additional pressure spikes. Additional troubleshooting was performed while attached to the ISS and the crew cycled the O_2 supply valve and again during the first test opening, O_2 was released into the cabin. After a cycle of the valve, the system began operating nominally. MCC-Moscow recommended the crew open the valve only partway at first (allowing the pressure to settle for 10 seconds) before opening the valve to the full open position.
  - <u>Status</u>: Under investigation

- *Neptune Panel Anomalies*
  - Soyuz 24S (TMA-01M) experienced an analog to digital failure during rendezvous with the ISS and analog data cannot be displayed on the Neptune panel. This was the first flight of the Soyuz 700 series with the upgraded Neptune panel.
  - No impact to ISS/Soyuz 24S integrated operations or nominal automated entry, however if unrepaired, manual entry is not possible and a ballistic entry is the only available backup entry mode after additional failures. Why? inability to display Soyuz atmosphere parameters, inability to display Soyuz angular rate data during autonomous flight.
  - <u>Status</u>: A Russian commission continues to investigate and will share findings with US when complete. Mitigation options include: placement of the US CSA-O2 unit in the Soyuz to measure O2 partial pressures; placement of a manual pressure gauge in the Soyuz; software patch to the Soyuz 24S Neptune panel; launch of 4 mini amp-meters to measure angular rates during descent; and hardware jumpers to bypass the faulty analog/digital converter. Some of this hardware may be launched on Progress 41P.

Total ISS Consumables Status: On-orbit Capability For Total Crew (December 30, 2010)

	T1: Current Capability with no other supply		T2: Current Capability with HTV2 Only	
Consumable	**Date to Reserve Level**	**Date to zero supplies**	**Date to Reserve Level**	**Date to zero supplies**
Food – 100% (1)(2)	April 14, 2011	June 5, 2011	May 14, 2011	July 5, 2011
KTO (2)	September 7, 2011	October 29, 2011	September 7, 2011	October 29, 2011
Filter Inserts	December 12, 2011	January 26, 2012	December 12, 2011	January 26, 2012
Toilet (ACY) Inserts (2)	November 6, 2011	December 28, 2011	November 6, 2011	December 28, 2011
EDV (UPA Operable) (3)(4)	March 29, 2011	May 12, 2011 (2)	April 16, 2011	June 7, 2011
RFTA (5)	Below Reserve	February 14, 2011 (6)	Below Reserve March 3, 2011	April 8, 2011 (7)
EDV (3)(4)(8) **(UPA failed) 12 crew days**	95 days	140 days	95 days	140 days
Water, if no WPA (Ag & Iodinated) (9)	July 26, 2011	September 9, 2011	August 1, 2011	September 15, 2011
O_2 if no OGA & Elektron supporting 3 crew (2)(10)(11)	March 13, 2011	July 13, 2011	March 13, 2011	July 13, 2011
O_2 if no Elektron or OGA (2)(10)(11)	February 2, 2011	March 21, 2011	February 2, 2011	March 21, 2011
LiOH (12) **(CDRA and Vozdukh off)**	~ 6.5 days	~20.5 days	~ 6.5 days	~20.5 days

Dock Dates: HTV2/27-JAN-11 41P/31-JAN-11 ULF/26-FEB-11 ATV2/23-FEB-11 ULF6/13-APR-11 26S/1-APR-11 42P/29-APR-11

(1) Includes RS food on Soyuz; after RS goes to zero, both sides share USOS food. (2) Reserve level to Zero is different than 45 days due to varying crew size. (3) Rodnik tanks included in assessment. (4) Limited RFTA supply results in UPA unavailability and the use of USOS EDVS for urine disposal. (5) Assumes no RS urine processing. Assumes 70% recovery rate. RFTA reserve date indicates one RFTA remaining. (6) UPA is currently being intermittently operated ("life-saving mode") to protect against potential periods of prolonged inoperability. This results in RFTA capability being extended. 7. UPA "life-saving mode" until supply vehicle docking, nominal UPA processing after supply vehicle docks. (8) Because failure date is unknown, 6 crew members are used in the calculations. (9) RS processes all condensate in event of WPA failure. (10) Metabolic 45 day reserve level does not include O2 reserve for CHeCS, two contingency EVAs, or module repress. (11) Shuttle supports ISS O2 for Shuttle crew needs during docked missions. (12) LiOH Canisters will be used for CO2 removal from the ISS if the CDRAs are inoperable. Total LiOH Reserve Level is 14 days for 6 crew. (Reserve Level for USOS LiOH is ~13.3 days for 3 crew (20 canisters), and for RS LiOH is 15 days for 3 crew (15 canisters).)

Total ISS Consumables Status: On-orbit Capability For Total Crew (December 30, 2010), continued

	T3: Current Capability with 41P Only		T4: Current Capability with ATV2 Only	
Consumable	**Date to Reserve Level**	**Date to zero supplies**	**Date to Reserve Level**	**Date to zero supplies**
Food – 100% (1)	May 26, 2011	July 12, 2011 **(2)**	June 8, 2011	July 23, 2011
KTO (2)	November 3, 2011	December 25, 2011	September 7, 2011	October 29, 2011
Filter Inserts	March 26, 2012	May 10, 2012	December 12, 2011	January 26, 2012
Toilet (ACY) Inserts	January 22, 2012	March 7, 2012	November 6, 2011	December 28, 2011 **(2)**
EDV (UPA Operable) (3)(4)	June 10, 2011	July 24, 2011 (2)	April 26, 2011	July 21, 2011
RFTA (5)	Below Reserve	February 14, 2011 **(6)**	Below Reserve April 2, 2011	February 14, 2011 May 2, 2011 **(7)**
EDV (3)(4)(8) **(UPA failed) 12 crew days**	161 days	206 days	167 days	212 days
Water, if no WPA (Ag & Iodinated) (9)	September 3, 2011	October 18, 2011	July 26, 2011	September 9, 2011
O_2 if no OGA & Elektron supporting 3 crew (2)(10)(11)	April 18, 2011	August 2, 2011	May 8, 2011	August 22, 2011
O_2 if no Elektron or OGA (2)(10)(11)	February 12, 2011	April 6, 2011	February 2, 2011	April 16, 2011
LiOH (12) (CDRA and Vozdukh off)	~ 6.5 days	~20.5 days	~ 6.5 days	~20.5 days

Dock Dates: HTV2/27-JAN-11 41P/31-JAN-11 ULF/26-FEB-11 ATV2/23-FEB-11 ULF6/13-APR-11 26S/1-APR-11 42P/29-APR-11

1) Includes RS food on Soyuz; after RS goes to zero, both sides share USOS food. (2) Reserve level to Zero is different than 45 days due to varying crew size. (3) Rodnik tanks included in assessment. (4) Limited RFTA supply results in UPA unavailability and the use of USOS EDVS for urine disposal. (5) Assumes no RS urine processing. Assumes 70% recovery rate. RFTA reserve date indicates one RFTA remaining. (6) UPA is currently being intermittently operated ("life-saving mode") to protect against potential periods of prolonged inoperability. This results in RFTA capability being extended. 7. UPA "life-saving mode" until supply vehicle docking, nominal UPA processing after supply vehicle docks. (8) Because failure date is unknown, 6 crew members are used in the calculations. (9) RS processes all condensate in event of WPA failure. (10) Metabolic 45 day reserve level does not include O2 reserve for CHeCS, two contingency EVAs, or module repress. (11) Shuttle supports ISS O2 for Shuttle crew needs during docked missions. (12) LiOH Canisters will be used for CO2 removal from the ISS if the CDRAs are inoperable. Total LiOH Reserve Level is 14 days for 6 crew. (Reserve Level for USOS LiOH is ~13.3 days for 3 crew (20 canisters), and for RS LiOH is 15 days for 3 crew (15 canisters).)

Total ISS Consumables Status: On-orbit Capability For Total Crew (December 30, 2010), continued

	T5: Current Capability with ULF5 Only		T6: Current Capability with HTV2, 41P & ATV2 Only	
Consumable	**Date to Reserve Level**	**Date to zero supplies**	**Date to Reserve Level**	**Date to zero supplies**
Food – 100% (1) (2)	April 22, 2011	June 13, 2011	August 15, 2011	October 6, 2011
KTO (2)	September 3, 2011	October 25, 2011	November 3, 2011	December 25, 2011
Filter Inserts	December 8, 2011	January 22, 2012	March 26, 2012	May 10, 2012
Toilet (ACY) Inserts	October 27, 2011	December 17, 2011	January 22, 2012	March 7, 2012
EDV (UPA Operable) (3)(4)	April 16, 2011	July 16, 2011	July 16, 2011	August 29,2011
RFTA (5)	Below Reserve July 3, 2011	February 14, 2011 August 2, 2011 **(7)**	Below Reserve May 8, 2011	June 18, 2011 **(7)**
EDV (3)(4)(8) **(UPA failed) 12 crew days**	95 days	140 days	233 days	278 days
Water, if no WPA (Ag & Iodinated) (9)	August 24, 2011	October 8, 2011	September 9, 2011	October 24, 2011
O_2 if no OGA & Elektron supporting 3 crew (2)(10)(11)	April 12, 2011	June 27, 2011	June 13, 2011	September 11, 2011
O_2 if no Elektron or OGA (2)(10)(11)	February 2, 2011	April 3, 2011	February 12, 2011 March 4, 2011	April 26, 2011
LiOH (12) (CDRA and Vozdukh off)	~ 4.5 days	~18.5 days	~ 6.5 days	~20.5 days

Dock Dates: HTV2/27-JAN-11 41P/31-JAN-11 ULF/26-FEB-11 ATV2/23-FEB-11 ULF6/13-APR-11 26S/1-APR-11 42P/29-APR-11

1) Includes RS food on Soyuz; after RS goes to zero, both sides share USOS food. (2) Reserve level to Zero is different than 45 days due to varying crew size. (3) Rodnik tanks included in assessment. (4) Limited RFTA supply results in UPA unavailability and the use of USOS EDVS for urine disposal. (5) Assumes no RS urine processing. Assumes 70% recovery rate. RFTA reserve date indicates one RFTA remaining. (6) UPA is currently being intermittently operated ("life-saving mode") to protect against potential periods of prolonged inoperability. This results in RFTA capability being extended. 7. UPA "life-saving mode" until supply vehicle docking, nominal UPA processing after supply vehicle docks. (8) Because failure date is unknown, 6 crew members are used in the calculations. (9) RS processes all condensate in event of WPA failure. (10) Metabolic 45 day reserve level does not include O2 reserve for CHeCS, two contingency EVAs, or module repress. (11) Shuttle supports ISS O2 for Shuttle crew needs during docked missions. (12) LiOH Canisters will be used for CO2 removal from the ISS if the CDRAs are inoperable. Total LiOH Reserve Level is 14 days for 6 crew. (Reserve Level for USOS LiOH is ~13.3 days for 3 crew (20 canisters), and for RS LiOH is 15 days for 3 crew (15 canisters).)

Total ISS Consumables Status: On-orbit Capability For Total Crew (December 30, 2010), continued

	T7: Current Capability with HTV2, 41P, ULF5 & ATV2 Only	
Consumable	**Date to Reserve Level**	**Date to zero supplies**
Food – 100% (1) (2)	August 23, 2011	October 14, 2011
KTO (2)	October 31, 2011	December 22, 2011
Filter Inserts	March 22, 2012	May 6, 2012
Toilet (ACY) Inserts	January 18, 2012	March 3, 2012
EDV (UPA Operable) (3)(4)	August 30, 2011	November 22, 2011
RFTA (5)	Below Reserve October 14, 2011	November 14, 2011 **(7)**
EDV (3)(4)(8) **(UPA failed) 12 crew days**	233 days	278 days
Water, if no WPA (Ag & Iodinated) (9)	October 1, 2011	November 15, 2011
O_2 if no OGA & Elektron supporting 3 crew (2)(10)(11)	June 27, 2011	October 11, 2011
O_2 if no Elektron or OGA (2)(10)(11)	February 12, 2011 March 11, 2011	May 3, 2011
LiOH (12) **(CDRA and Vozdukh off)**	~ 4.5 days	~18.5 days

Dock Dates: HTV2/27-JAN-11 41P/31-JAN-11 ULF/26-FEB-11 ATV2/23-FEB-11 ULF6/13-APR-11 26S/1-APR-11 42P/29-APR-11

1) Includes RS food on Soyuz; after RS goes to zero, both sides share USOS food. (2) Reserve level to Zero is different than 45 days due to varying crew size. (3) Rodnik tanks included in assessment. (4) Limited RFTA supply results in UPA unavailability and the use of USOS EDVS for urine disposal. (5) Assumes no RS urine processing. Assumes 70% recovery rate. RFTA reserve date indicates one RFTA remaining. (6) UPA is currently being intermittently operated ("life-saving mode") to protect against potential periods of prolonged inoperability. This results in RFTA capability being extended. 7. UPA "life-saving mode" until supply vehicle docking, nominal UPA processing after supply vehicle docks. (8) Because failure date is unknown, 6 crew members are used in the calculations. (9) RS processes all condensate in event of WPA failure. (10) Metabolic 45 day reserve level does not include O2 reserve for CHeCS, two contingency EVAs, or module repress. (11) Shuttle supports ISS O2 for Shuttle crew needs during docked missions. (12) LiOH Canisters will be used for CO2 removal from the ISS if the CDRAs are inoperable. Total LiOH Reserve Level is 14 days for 6 crew. (Reserve Level for USOS LiOH is ~13.3 days for 3 crew (20 canisters), and for RS LiOH is 15 days for 3 crew (15 canisters).)

ISS Systems Status Summary

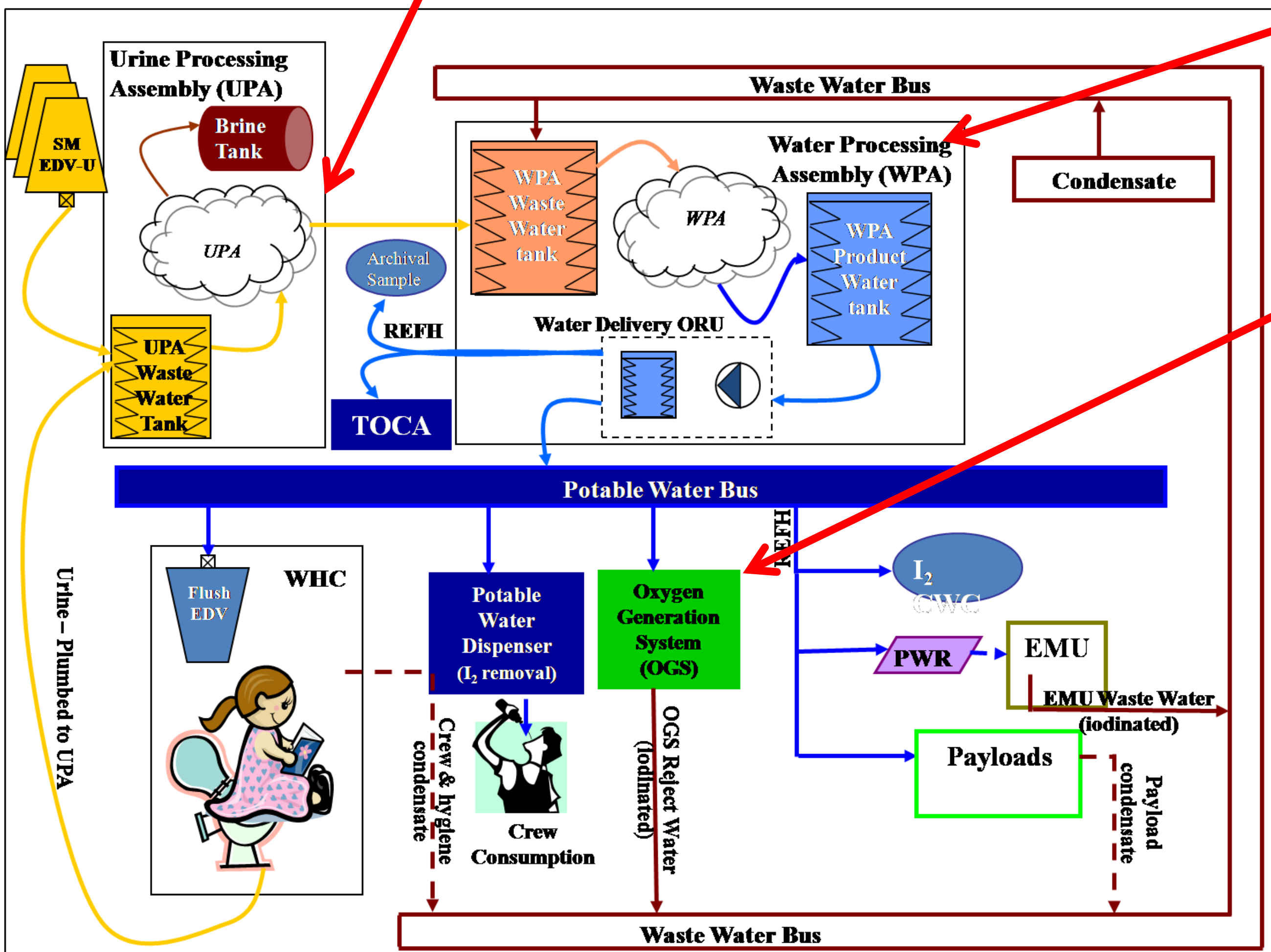
System	Dec 10	Jan 11	Status/Issues
Command and Data Handling	G	G	
Communication and Tracking	G	G	
Crew Health Care	G	G	Maintenance of exercise equipment is a continual challenge.
Environmental Control and Life Support	G	G	Urine Processing Assembly (UPA): With the delivery of Recycle Filter Tank Assemblies (RFTA) on HTV2, UPA returned to nominal operations. More RFTAs are on ULF5. Must solve long term problem with precipitates that caused the DA failure. A team is investigating urine chemistry and precipitation remediation options. Water Processing Assembly (WPA): Operational. Previously elevated levels of total organic carbons in the product water have declined to nominal levels. Root cause not yet known. Carbon Dioxide Removal Assembly (CDRA): Two working CDRAs on orbit. Node 3 CDRA will get a new bed on ULF5. Long term issues with delta pressure increases, but the pressures seem to have stabilized for now (see chart), possibly due to design of newer -3 beds. Oxygen Generation Assembly (OGA): Operational, but limiting usage due to low pH of recirculation loop water. Developing a procedure to replenish the loop with fresh water (a.k.a. bleed and feed). ULF5 to deliver a pH remediation kit. OGA recirculation loop delta pressures can be managed with periodic ORU/filter replacements. OGA to be run primarily at 50% production levels to mitigate increases in cell voltage within cell stack (see chart). Sabatier: The Sabatier water production system will be operated at least monthly; more if needed. General: Numerous ECLSS spares are to be delivered on ULF5 and ULF6.
Electrical Power	G	G	Remote Power Control Modules (RPCM) with FET hybrid issues. DC-to-DC Converter Unit (DDCU) S01A experienced a power-on-reset on January 23.
Extravehicular Activity (EVA)	G	G	
Robotics	G	G	SPDM demo on December 22 exercised capabilities needed for HTV2 robotic operations, planned for this week. SPDM checkout is complete.
Flight Crew Equipment	G	G	
Guidance, Navigation & Control	G	G	CMG4 vibration spikes experienced after the Pump Module replacement appear to be tied to low bearing temperatures that track with beta, but cause under investigation.
Propulsion	G	G	
Structures and Mechanisms	G	G	Starboard SARJ has a nominal operating frequency that causes the S1 lower outboard camera stanchion to vibrate - will reevaluate camera loads after a camera wedge is installed on ULF5. No truss loads concerns.
Thermal Control	G	G	Face sheet peeled back on one S1 radiator panel – low risk. Failed Pump Module is on the POA until ULF5 when it will be moved to External Stowage Platform 2. Failed Pump Module will return on ULF7. Failure cause unknown.

RED: System performance is degraded with significant impact to operations
YELLOW: Degraded system performance. Some operations are impacted.
GREEN: Acceptable performance. Degraded performance may be deemed acceptable, depending on redundancy, spares availability, or criticality level.

Regenerative ECLSS Challenges

UPA: *Operational*

- Limiting Recycle Filter Tank Assembly (RFTA) fill levels to prevent calcium sulfate precipitation that caused the failure of the first Distillation Assembly (DA)
- Urine chemistry analysis continues to address precipitation and maximize RFTA % usage
- Delivery of more RFTAs on HTV-2 and STS-133/ULF5 allows return to more nominal UPA operations
- Advanced RFTA (ARFTA) to be delivered in September 2011 will reduce RFTA resupply requirements



WPA: *Operational*

- After rising steadily for several months, the Total Organic Carbons (TOC) levels declined and are below detectable levels
- Analysis into cause of the TOC rise and subsequent decline continues

OGS: *Operational , but limited*

- Increasing delta pressures within OGS recirculation loop due to filter loading - periodic ORU/filter replacements needed to maintain OGS operations
- Declining pH in recirculation loop water is a long term concern – pursuing remediation options to keep pH above minimum allowable operating levels
- Recent change to run OGS at 50% production, to mitigate increases in cell voltage possibly tied to higher production modes

General challenge:

- Management of water and waste stowage